

# Curriculum Vitae

## Thomas Garrett Kennedy

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### Education

- 1984 Ph.D. in Mathematics, University of Virginia  
Advisor: David Brydges, Major field: mathematical physics.  
Doctoral dissertation: "Mean field theory for Coulomb systems"
- 1981 M.A. in Mathematics, Indiana University
- 1977 B.S. in Mathematics, California Institute of Technology

### Employment

- 1995 - present Professor, Mathematics Department, University of Arizona
- 2016 - 2017 Interim Head, Mathematics Department, University of Arizona
- 2009 - 2014 Assoc. Head for the Graduate Program, Math Dept., U. of Arizona
- 2008 - 2009 Interim Head, Mathematics Department, University of Arizona
- 1998 - 1999 Acting Head, Program in Applied Mathematics, University of Arizona
- 1988 - 1995 Associate Professor, Mathematics Department, University of Arizona
- 1985 - 1988 Assistant Professor, Physics Department, Princeton University
- 1984 - 1985 Instructor, Physics Department, Princeton University

### Other Appointments

- 1996 - present Professor (joint appointment), Physics Department
- 1988 - present Member, Graduate Interdisciplinary Program in Applied Mathematics
- 2008 - present Member, Graduate Interdisciplinary Program in Statistics

### Awards

- 1986-1989 NSF Mathematical Sciences Post-doctoral Research Fellowship

## Grants

- 2015-2019 NSF DMS-1500850, \$361,417, sole PI  
Conformal invariance and the renormalization group in some critical systems
- 2008-2011 NSF DMS-0758649, \$306,938, sole PI  
Critical and Near Critical systems in Statistical Mechanics
- 2005-2008 NSF DMS-0501168, \$142,337, sole PI  
Mathematical Problems from Statistical Mechanics
- 2002-2005 NSF DMS-0201566, \$132,199, sole PI  
Problems in Quantum and Classical Statistical Mechanics
- 1999-2002 NSF DMS-9970608, \$96,837, sole PI  
Crystalline Order in Classical and Quantum Mechanical Systems
- 1999-2004 NSF DMS 9977116, VIGRE grant, co-PI, 15 % effort
- 1999 NSF DMS-9988119, \$36,403, PI, 50 % effort  
International Congress on Mathematical Physics, 2000, London: Travel Funds
- 1996-1999 NSF DMS-9623509, \$95,922, sole PI  
Statistical Mechanics of Classical and Quantum Lattice Systems
- 1993-1996 NSF DMS-9303051, \$109,617, sole PI  
Itinerant Electron Systems and Quantum Mechanical Spin Systems
- 1991-1993 NSF DMS-9103621, \$43,000, sole PI  
Quantum Mechanical, Classical Lattice Spin Systems
- 1989-1991 NSF DMS-8902248, \$33,900, sole PI  
Classical and Quantum Mechanical Lattice Spin Systems

## Ph.D. Dissertation Supervision

- Yan Dai, current Ph.D. student, Department of Mathematics
- Jianping Jiang, Department of Mathematics, Ph.D. May 2015.
- Michael Gilbert, Department of Mathematics, Ph.D. August 2013.
- Benjamin Dyhr, Department of Mathematics, Ph.D., August 2009
- Karl Haller, Program in Applied Mathematics, Ph.D., August 1998.
- Martin Pokorny, Program in Applied Mathematics, Ph.D., August 1992.

## Published Articles

1. A lower bound on the partition function for a classical charge symmetric system. *J. Stat. Phys.* **28**, 633-638 (1982).
2. Debye-Huckel theory for charge symmetric Coulomb systems. *Commun. Math. Phys.* **92**, 269-294 (1983).
3. Mean field theory for Coulomb systems. *J. Stat. Phys.* **37**, 529-559 (1984).

4. Long range order in the anisotropic quantum ferromagnetic Heisenberg model. *Commun. Math. Phys.* **100**, 447-462 (1985).
5. (with Paul Federbush) Surface effects in Debye screening. *Commun. Math. Phys.* **102**, 361-423 (1985).
6. (with Chris King) Symmetry breaking in the lattice abelian Higgs model. *Phys. Rev. Lett.* **55**, 776-778 (1985).
7. (with Chris King) Spontaneous symmetry breakdown in the abelian Higgs model. *Commun. Math. Phys.* **104**, 327-347 (1986).
8. (with Elliott Lieb) An itinerant electron model with crystalline or magnetic long range order. *Physica* **138A**, 320-358 (1986).
9. (with David Brydges) Mayer expansions and the Hamilton-Jacobi equation. *J. Stat. Phys.* **48**, 19-49, (1987).
10. (with Ian Affleck, Elliott Lieb, Hal Tasaki) Rigorous results on valence-bond ground states in antiferromagnets. *Phys. Rev. Lett.* **59**, 799-802 (1987).
11. (with Elliott Lieb) Proof of the Peierls instability in one dimension. *Phys. Rev. Lett.* **59**, 1309-1312 (1987).
12. (with Ian Affleck, Elliott Lieb, Hal Tasaki) Valence-bond ground states in isotropic quantum antiferromagnets. *Commun. Math. Phys.* **115**, 477-528 (1988).
13. (with Elliott Lieb, Hal Tasaki) A two dimensional isotropic quantum antiferromagnet with unique disordered ground state. *J. Stat. Phys.* **53**, 383 (1988).
14. (with Elliott Lieb, B. Sriram Shastry) Existence of Néel order in some spin 1/2 Heisenberg antiferromagnets. *J. Stat. Phys.* **53**, 1019 (1988).
15. (with Elliott Lieb, B. Sriram Shastry) The XY model has long-range order for all spins and all dimensions greater than one. *Phys. Rev. Lett.* **61** 2582 (1988).
16. A fixed point equation for the high temperature phase of discrete lattice spin systems. *J. Stat. Phys.* **59**, 195-220 (1990).
17. Exact diagonalization of open spin 1 chains. *J. Phys.: Condens. Matter* **2**, 5737-5745 (1990).
18. (with Dandan Guo and Sumit Mazumdar) Spin-Peierls transitions in  $S > 1/2$  Heisenberg chains. *Phys. Rev.* **B41**, 9592 (1990).
19. Ornstein-Zernike decay in the ground state of the quantum Ising model in a transverse magnetic field. *Commun. Math. Phys.* **137**, 599-615 (1991).
20. (with Hal Tasaki) Hidden  $Z_2 \times Z_2$  symmetry breaking in Haldane gap antiferromagnets. *Phys. Rev.* **B45**, 304 (1992).
21. (with Hal Tasaki) Hidden symmetry breaking and the Haldane phase in  $S = 1$  quantum spin chains. *Commun. Math. Phys.* **147**, 431-484 (1992).
22. Solutions of the Yang-Baxter equation for isotropic quantum spin chains. *J. Phys. A: Math. Gen.* **25**, 2809 (1992).
23. Some rigorous results on majority rule renormalization group transformations near the critical point. *J. Stat. Phys.* **72**, 15-37 (1993).

24. Some rigorous results on the ground states of the Falicov-Kimball model. *Rev. Math. Phys.* **6**, 901-925 (1994). Also in *The State of Matter*, Michael Aizenman and Huzihiro Araki (eds.) World Scientific, 1994.
25. Ballistic behavior in a 1-d weakly self-avoiding walk with decaying energy penalty. *J. Stat. Phys.* **77**, 565-579 (1994).
26. Nonpositive matrix elements for Hamiltonians of spin 1 chains. *J. Phys.: Condens. Matter* **6**, 8015-8022 (1994).
27. (with Karl Haller) Absence of renormalization group pathologies near the critical temperature - two examples. *J. Stat. Phys.* **85**, 607-637 (1996).
28. Majority Rule at Low Temperatures for the Square Lattice with  $b = 2$  and for the Triangular Lattice. *J. Stat. Phys.* **86**, 1089-1107 (1997).
29. Phase separation in the neutral Falicov-Kimball model. *J. Stat. Phys.* **91**, 829-843 (1998).
30. (with Karl Haller) Periodic Ground States in the Neutral Falicov-Kimball Model in Two Dimensions. *J. Stat. Phys.* **102**, 15-34 (2001).
31. A faster implementation of the pivot algorithm for self-avoiding walks. *J. Stat. Phys.* **106**, 407-429 (2002).
32. (with Nilanjana Datta) Expansions for one quasiparticle states in spin 1/2 systems. *J. Stat. Phys.* **108**, 373-399 (2002).
33. Monte Carlo tests of SLE predictions for the 2D self-avoiding walk. *Phys. Rev. Lett.* **88**, 130601 (2002).
34. Conformal invariance and stochastic Loewner evolution predictions for the 2D self-avoiding walk - Monte Carlo tests. *J. Stat. Phys.* **114**, 51-78 (2004).
35. (with Nilanjana Data) Instability of interfaces in the antiferromagnetic XXZ chain at zero temperature, *Commun. Math. Phys.* **236**, 477 (2003).
36. Expansions for Droplet States in the Ferromagnetic XXZ Heisenberg Chain. *Markov Processes and Related Fields* **11**, 223 (2005).
37. Compact packings of the plane with two sizes of discs, *Discrete and Computational Geometry* **35**, 255-267 (2006).
38. A fast algorithm for simulating the chordal Schramm-Loewner evolution. *J. Stat. Phys.* **128**, 1125-1137 (2007).
39. The length of an SLE - Monte Carlo studies. *J. Stat. Phys.* **128**, 1263-1277 (2007).
40. Computing the Loewner driving process of random curves in the half plane. *J. Stat. Phys.* **131**, 803-819 (2008).
41. (with Michel Bauer and Denis Bernard) Conditioning SLE's and loop erased random walks. *J. Math. Phys.*, **50**, 043301 (2009).
42. Renormalization group maps for Ising models in lattice gas variables. *J. Stat. Phys.* **140**, 409-426 (2010).
43. Numerical computations for the Schramm-Loewner Evolution. *J. Stat. Phys.* **137**, 839-856 (2009).

44. (with Ben Dyhr, Michael Gilbert, Gregory F. Lawler, Shane Passon). The self-avoiding walk in a strip *J. Stat. Phys.* **144**, 1-22 (2011).
45. Transforming fixed-length self-avoiding walks into radial SLE<sub>8/3</sub>. *J. Stat. Phys.* **146**, 281-293 (2012).
46. (with Gregory F. Lawler). Lattice effects in the scaling limit of the two-dimensional self-avoiding walk, *AMS Contemporary Mathematics* **601**, 195-210 (2013).
47. Simulating self-avoiding walks in bounded domains. *J. Math. Phys.* **53**, 095219 (2012).
48. (with Tony Guttmann). Self-avoiding walks in a rectangle *J. Eng. Math.* **84**, 201-208 (2014).
49. Conformal invariance of the 3D self-avoiding walk *Phys. Rev. Lett.* **111**, 165703 (2013).
50. Conformal invariance predictions for the three-dimensional self-avoiding walk, *J. Stat. Phys.* **158**, 1195-1212 (2015).
51. The Smart Kinetic Self-Avoiding Walk and Schramm-Loewner Evolution, *J. Stat. Phys.* **160**, 302-320 (2015).
52. (with Jianping Jiang). The difference between a discrete and continuous harmonic measure *J. Theoret. Probab.* **30**, 1424-1444 (2017).
53. The first order correction to the exit distribution for some random walks, *J. Stat. Phys.* **164**, 174-189 (2016).
54. A non-intersecting random walk on the Manhattan lattice and SLE<sub>6</sub>.  
Preprint : <http://arxiv.org/abs/1803.06728>
55. Conformal invariance of the loop-erased percolation explorer  
Preprint : <http://arxiv.org/abs/1806.11561>

**Note:** The recent papers above are archived in arXiv.org. Links are on my home page.

## Invited Talks : 1998 to Present

1. *Phase separation and periodic ground states in the neutral Falicov Kimball model*, invited talk at the conference “Mathematical Results in Statistical Mechanics,” Marseille, France, July 27-31,1998.
2. *Weakly self-avoiding walks*, invited talk at the conference “Self-interacting Random Processes,” held at Mathematisches Forschungstitut Oberwolfach in Germany from May 21-27, 2000.
3. *Weakly self-avoiding walks*, invited talk, University of Geneva, June 5, 2000.
4. *Weakly self-avoiding walks*, invited talk, Institut de Physique Théorique at the École Polytechnique Fédérale de Lausanne, Switzerland, June 5, 2000.
5. *Quasiparticles and interfaces in anisotropic quantum Heisenberg chains*, invited talk, Ecole Polytechnique Fédérale de Lausanne (Switzerland), Oct 10, 2002.
6. *Monte Carlo tests of conformal invariance and SLE predictions for the self-avoiding walk*, invited talk, Ecole Polytechnique Fédérale de Lausanne (Switzerland), Oct 25, 2002.

7. *Monte Carlo tests of conformal invariance and SLE predictions for the self-avoiding walk*, invited talk, Universite de Paris - Sud (Orsay, France), Nov 7, 2002.
8. *Monte Carlo tests of conformal invariance and SLE predictions for the self-avoiding walk*, invited talk, Centre de Physique Théorique, Luminy, France, Nov 29, 2002.
9. *Monte Carlo tests of SLE predictions for the self-avoiding walk*, invited talk at the mini-conference “Autour du SLE” which was part of the special trimester “Geometry and Statistics of Random Growth” at the Henri Poincare Institute (Paris, France), January 16, 2003.
10. *Quasi-particles and interfaces in quantum lattice systems*, invited talk at the conference “Inhomogeneous Random Systems” at the University of Cergy-Pontoise, France, Jan 28-29, 2003.
11. *Monte Carlo tests of conformal invariance and SLE predictions for self-avoiding walk*, invited talk, Physics Department, University of Geneva, Switzerland, Feb 3, 2003.
12. *Itinerant Electron Systems - An Introduction and Review of Rigorous Results*, and *Interfaces and Droplets in the Quantum XXZ Heisenberg Model*, invited talks at the conference “Classical and Quantum Phase Transitions, Crystal Formation and Bose-Einstein Condensation” at the CIRM in Luminy, France, March 17-21, 2003.
13. *Monte Carlo tests of conformal invariance and SLE predictions for the self-avoiding walk*, invited talk, Physics department, ETH, Zurich, Switzerland, May 26, 2003.
14. *Monte Carlo tests of conformal invariance and SLE predictions for the self-avoiding walk* and *An introduction to simulating the self-avoiding walk*, invited talks at the conference “Conformal Invariance and Random Spatial Processes” at the ICMS in Edinburgh, Scotland, July 9-18, 2003.
15. *Monte Carlo comparisons of the self-avoiding walk and SLE - How should SLE be parametrized?*, invited talk at the conference “Dynamics, Probability, and Conformal Invariance,” Banff International Research Station, Banff, Canada, March 12-17, 2005.
16. *Monte Carlo comparisons of the self-avoiding walk and SLE as parametrized curves*, invited talk at the conference “93rd Statistical Mechanics Conference” at Rutgers University, May 15, 2005.
17. *Monte Carlo comparisons of the self-avoiding walk and SLE as parametrized curves*, invited talk at the conference “Critical Scaling for Polymers and Percolation” at the Banff International Research Station, May 28 to June 2, 2005.
18. *The length of an SLE - Monte Carlo studies*, invited talk, Kavli Institute for Theoretical Physics, September 19, 2006.
19. *Numerical simulation of random curves*, invited series of four talks, 2008 Enrage Topical School on “Growth and Shapes,” Institut Henri Poincaré, Paris, June 2-6, 2008.
20. *Testing for SLE using the driving process*, invited talk, 13th Itzykson Conference “Puzzles of Growth,” Saclay, France, June 9-11, 2008.
21. *Monte Carlo Studies of Self-Avoiding Walks and Loops*, invited talk at the conference “Stochastic Loewner Evolution and Scaling Limits,” CRM, Montreal, Canada, August 4-8, 2008.

22. *Renormalization group maps for Ising models in lattice gas variables*, invited talk at the conference “The Renormalization Group and Statistical Mechanics,” University of British Columbia, Vancouver, Canada, July 6-12, 2009.
23. *The 2d Self-avoiding walk - bridges, strips and hitting densities*, Probability seminar, University of Chicago, February 5, 2010.
24. *Conformal invariance and covariance of the 2d self-avoiding walk*, invited talk at the AMS Western Sectional Meeting, Albuquerque, New Mexico, April 17, 2010.
25. *Renormalization group maps for Ising models in lattice gas variables*, invited talk at the conference “103rd Statistical Mechanics Conference,” Rutgers University, New Brunswick, New Jersey, May 9, 2010
26. *Efficient SLE algorithms and numerical pitfalls of the method*, APS March Meeting Invited Talk, Boston, February 28, 2012.
27. *Ten ways in which the self-avoiding walk should converge to SLE*, MSRI Research Seminar, April 24, 2012.
28. *Self-avoiding walk ensembles that should converge to SLE*, UC Davis, Math Physics Seminar, May 9, 2012.
29. *The first order correction to the exit distribution for some random walks*, Invited talk at the conference “Random Structures in High Dimensions,” Oaxaca, Mexico, June 27, 2016.